

**Sediment Handling  
Demonstration at  
Lacon, Illinois, Using  
Concrete Pump and  
Conveyor Trucks**

**John C. Marlin**

**Waste Management and  
Research Center**

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# **Sediment Handling Demonstration at Lacon, Illinois, Using Concrete Pump and Conveyor Trucks**

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## **Sediment Handling Demonstration at Lacon, Illinois, Using Concrete Pump and Conveyor Trucks**

### **Summary.**

Sediment excavated from an Illinois River backwater with a clamshell bucket was stockpiled on a field. The following day it loaded into concrete handling trucks. A concrete pump and placing boom had little difficulty handling the material. A telescoping conveyor also handled the material with little difficulty. The sediment stayed on the belts and negotiated the transfer point. The belt cleaners performed well. Minor problems, such as bridging in hoppers and splatter at some fittings designed for concrete, can be addressed with some operational or other changes. The pumps, booms, belts and scrapers satisfactorily handled this material.

### **Introduction.**

The ability to transport and place dredged material at or near *in situ* moisture conditions will aid in beneficial use of sediment where it is to be used as soil or fill. The primary advantage is placement without making provision for the large amounts of free water, which are typically generated by hydraulic dredging. This results in rapid drying of the sediment. This demonstration used a crane and clamshell bucket to excavate sediment from Wightman Lake, an Illinois River backwater (figures 1 and 2). After excavation, sediment was stockpiled overnight in a field. The following day it was used in the demonstration of the capabilities of a conventional truck mounted conveyor and a truck mounted concrete pump with placing boom (Figures 3-5). The equipment, accompanied by factory representatives, was supplied by Putzmeister, which manufactures both trucks. The purpose of the demonstration was to determine whether the equipment would readily handle the material, not to test its capacity.

### **Sediment Collection.**

Sediment for the demonstration was collected on September 25, 2002 at the mouth of Wightman Lake at approximately river mile 187.3 just south of Lacon, Ill. Due to the shallow nature of the backwater, sediment was taken within 300 feet of the main navigation channel. Woermann maps from 1902 were used to locate an area that was historically relatively deep. This location was selected to improve the chance of obtaining deposited sediment rather than original bottom material. A conventional 4 yard clamshell bucket was used to place about 200 cubic yards sediment on a deck barge. The operator stirred the material as little as possible and allowed the bucket to drain prior to depositing the material on the barge. In most cases the sediment heaped in the bucket and water readily ran off. Very little free water accompanied the sediment, which slumped only slightly when placed on the barge deck (Figures 6-9). No large debris or

other foreign objects were observed in the sediment. The loaded barge was towed about 2.5 miles to Lacon where it was clamshelled into a dump truck and deposited in an upland field on the day of collection. The deposited material was cohesive and formed piles approximately 33 inches high at the center at the time of placement (Figures 10-12). It was left in the field overnight prior to the demonstration that began at 9 a.m. on September 26.

### **Pump Truck Demonstration.**

There is increasing interest in the use of concrete pumps to handle sediment. In 1996 DRE and the Waterways Experiment Station completed development and testing of the Dry Dredge™ a portable floating device for removing high solids sediment. This dredge used a displacement pump to force sediment through a pipe. The Dry Dredge™ has been used on numerous projects since then. Freestanding concrete pumps loaded with clamshell buckets have been used on several sediment removal projects. Putzmeister and Schwing are two pump makers with such experience. Both make trucks with concrete pumps and extendable placing booms that can place pumped material over 100 feet from the truck. Either company's truck would have been suitable for the demonstration.

A Putzmeister truck with a 32-meter articulated placing boom with a five inch line size and pump capable of handling 200 cubic yards per hour was used for the demonstration. Dredged material was carried from the storage pile to the truck in a bucket on a small skidder. The material was placed in a hopper at the back of the truck that fed the pump. The boom was able to precisely place material wherever it reached. During much of the demonstration the boom was used to place material into the hopper of the conveyor truck. Material pumped into the conveyor hopper moved freely down its sides onto the belt without bridging or building up (Figures 13-17).

Dredged material pumped through the boom to the field formed a circular cone that had a height of 2.85 feet with a radius of 9.5 feet immediately after pumping. Three hours later it was 1.85 feet high with a radius of 10.3 feet (Figures 18 and 19). The lost height was mostly a steep cone about two feet in diameter centered at the discharge point. The edge of the pile was curved and steep. The slope from one foot from the edge to the center was about 14 percent. Detailed information on the cone is presented in Appendix A.

A grate over the hopper with openings about two inches wide normally filters concrete as it flows into the hopper. Sediment bridged over the grate openings and the grate was removed for most of the demonstration. It was not necessary to add water as the material readily entered the pump, although it stacked higher than the edge of the hopper. No debris that threatened to plug the pump or hopper was encountered.

The pump easily handled the dredged material. Although the pump capacity is 200 cubic yards per hour, only about 20 cubic yards per hour were pumped during the demonstration. This was due to the inability of the endloader to deliver material at a higher rate. Additionally the hopper was narrower than the bucket, causing spillage that further limited throughput.

Bill Carbeau, the Putzmeister Sales and Product Manager for Telebelts and Specialty Equipment provided the following comment:

”Our observation was that there is no problem whatsoever in pumping this material. The pressure readings were very low indicating little resistance or power required to move this material. We estimate no problem in moving this material over distances up to 2 miles horizontally with pumps based on appearance and flowability of the material, and pressure generated by the equipment” (Appendix B).

The demonstration showed that the pump and placing boom are fully capable of handling debris-free dredged material typical of that found in Illinois River backwaters. Higher capacity could be attained by the use of more suitable equipment to feed the pump, including a larger hopper. Additionally, for large projects it will be necessary to screen out objects that may clog the pump or pipe.

The articulating placing boom can place sediment wherever it can reach. For example, it could load trucks on top of a levee, reach above and through trees to place material onto the interiors of islands, or spread sediment over large areas at a uniform or varying depth. Additional flexibility is possible because the pump and boom can be mounted separately and do not necessarily require a truck. A pump mounted on a shallow draft float could deliver sediment to a discharge point over a considerable distance.

### **Conveyor Truck Demonstration.**

A Putzmeister TB105 telebelt was used for this demonstration. This is a truck mounted telescoping conveyor with a maximum reach of 105 feet capable of moving up to 350 cubic yards of material per hour (Figure 20). Material is placed in a hopper that feeds a short conveyor that carries material to a transfer point on top of the truck where it moves to the main conveyor. The transfer point is covered to prevent splattering of concrete.

The telebelt hoppers are designed to handle concrete and coarse material up to 4-inch gravel. The hoppers are narrow and sit close to the belt. The thick, moist sediment bridged over the bottom opening of the hopper rather than rapidly falling through it onto the moving feeder belt. Shovels were used occasionally to push material through the hopper. When the hopper was raised several inches with boards, the moving belt pulled large dollops of material from the bottom of the hopper. These chunks moved readily up the feeder belt, through the transfer point and onto the main belt. The material was flattened as it passed under the transfer point’s cover, but maintained its consistency (Figures 21-27). The sediment occasionally hit guides and braces above or on the sides of the feeder belt and the transfer point causing some splatter. These appear to be minor issues that can be addressed without difficulty. A modified hopper and some changes in fittings designed for concrete would likely resolve the problem. Splatter was not an issue on the main belt.

The bulk of the material for the conveyor demonstration was pumped into the hopper through the pump truck placing boom. After pumping this material was less cohesive than that loaded from the skidder bucket. However, it presented no serious problems on the feeder belt, transfer point or main belt. When pumped onto the side of the hopper the sediment sloughed and smeared onto the side of the belt in a flattened shape (Figures 28-30). This caused some splatter when it hit guides and other conveyor parts. When the discharge was in line with the moving belt, it stayed centered on the belt eliminating most of the splatter. In another centered configuration, the material discharged in a tubular shape, which remained intact on the feeder belt without causing splatter. The material then flattened somewhat upon moving through the transfer point (Figures 31-33).

The belt scrapers cleaned both belts of sediment and no carry back was observed. The extended conveyor transported material up an incline of about 30 degrees without difficulty (Figures 34-36). The material did not liquefy or slide on the belt, although this may be a concern if sediment with higher moisture content is conveyed, especially over longer distances. At no time was the conveyor fully loaded because the available equipment could feed only limited amounts of material. The pump truck was moved closer to the sediment stockpile to allow the endloader fill the hopper more quickly.

Like the placing boom, the conveyor was able to place material in precise patterns. A remote control allowed the operator to stand near the end of the extended conveyor and move it horizontally and vertically. The conveyor was used to create two plots about 20x 60 feet: one approximately six inches and the other one foot deep (Figures 37 and 38). The conveyor also deposited a cone shaped pile of sediment that 15 minutes after placing had an initial height of 2.1 and radius of 9.3 feet (Figure 39). Three hours later its height was 1.85 and its radius 9.4 feet. Its shape after three hours was similar to that of the pumped pile. Details are presented in Appendix A. This material had been pumped to the conveyor hopper and then conveyed. Material that was end loaded directly to the conveyor without being pumped appeared to have more strength than the pumped material. It would likely have piled somewhat higher.

### **Physical Properties of Dredged Material.**

Several samples of the dredged material were taken at various stages of the demonstration and placed in sealed plastic bags. The samples for the demonstration were taken to a certified laboratory in Peoria. Some of the analysis results are in Table 1 and the complete report is in Appendix C, which also contains information from other projects. The samples from the sediment handling demonstration have a "WTM" designation. As stated earlier, the material was cohesive and had no free water. A Putzmeister representative described it as having very low abrasion characteristics and a slump of approximately 12.

Four samples from different bucket loads of sediment were taken from the barge at the collection site for moisture content analysis. The samples had average moisture content (MC) of 76.5% on a dry weight basis. Three were similar and had a MC average of



85.7%. One sample (WTM-8) had an MC of 49.0%. This and the grain size analysis indicate that WTM-8 was most likely taken at the interface between pre-impoundment soil and sediment deposited in the more recent past.

At 8 a.m. after the sediment sat in the field overnight, one 2.3-foot deep pile was sampled near its top, middle, and bottom. The MC at the three spots was 60.1, 61.3, and 56.9 indicating little moisture loss to the dry soil of the field or to the air. Two samples were taken from separate plots of deposited sediment at 3 pm after the demonstration. Their MC was 54.1 and 60.8.

Specific Gravity of three samples taken from the barge averaged 2.58. Atterberg limits and grain size were obtained for two samples WTM-11 and WTM-8. WTM-8 is believed to be atypical of sediment deposited since 1900. WTM 8 was 26% sand with 74% of the material passing through a #200 sieve. WTM-11 was 9% sand with 91.2% passing through a #200 sieve. Atterberg limits are in the Appendix C. WTM-11 is likely more typical of backwater sediment as indicated by the samples taken near the channel in Lower Peoria Lake for a related project (Spin-1 and Spin-2) which are similar to it.

The weather recorded at Peoria, about 30 miles south of the project site, during the two days was mild. The mean temperature was 61 degrees F on September 25 and 63 on the 26<sup>th</sup>. It did not rain at Lacon on either day.

**Table 1. Physical Properties of Sediment During Demonstration.**

Sample	% Moisture, Dry Weight Basis*	% Passing 200 Mesh Sieve	% Sand	Comment
WTM-6	81.6			9/25 on barge deck
WTM-7	81.9			9/25 on barge deck
WTM-8	49.0	74	26	9/25 on barge deck
WTM-11	93.6	91.2	9	9/25 on barge deck
WTM-12	60.1			9/26,8am, top of stockpile
WTM-13	61.3			9/26,8am, middle of stockpile
WTM-14	56.9			9/26,8am, bottom of stockpile
WTM-15	54.1			9/26, 3pm, after pumping
WTM-16	60.8			9/26, 3pm, after pumping
Spin-1**	92.8	91.4	9	9/27, R mile 165.5 sediment
Spin-2	91.0	93.8	6	9/27, R mile 165.5 sediment
* Water weight of sample divided by the net weight of dry soil from the sample				
** These samples are from the top layer of sediment near the channel 22 miles downstream and are presented for comparison				

## **Follow Up Visits.**

Researchers made several visits to the site to observe the drying and weathering of the dredged material and obtain information on its potential beneficial use as soil.

On October 1, five days after placement, annual rye grass seed was sown on half of the two cone shaped plots and one third of the two 20x60 plots. Seed was sown on the day of the demonstration, but its quality was questionable. The plots were all soft and had desiccation cracks. It was possible to lightly step on the 6-inch deep plot (Figures 40 and 41).

By October 9, grass had germinated in the cracks and was up to three inches long. We speculate the wind and rain moved the seeds into the cracks where there was enough moisture for germination. The dry crusted layer of sediment on top of the plots appeared unsuitable for seed germination. Little grass germinated along the edges of the plots and the grass was not doing as well on the 6-inch deep plot as the others (Figures 42 and 43). The likely reason is that the edges and thinner layers dried more quickly making germination difficult. The 6-inch plot was firm and easily walked upon. While the crust on the 12-inch plot and cones readily supported a person's weight, the underlying material near the original soil was quite soft.

On October 22 grass was well established in the cracks on the cone plots and part of the 12-inch plot. It was sparser on the 6-inch plot. All plots readily and comfortably supported a person's weight. The material in both plots was hard where dry and had no visible soil structure (Figures 44-46). The lower layer of sediment was no longer soft.

By January 8, 2003 the plots appeared similar to the prior visit. The grass was still green and well established. There were some signs of soil structure on the surface of some of the clods formed by desiccation cracks. However, the top several inches easily crumbled with light pressure from fingers (Figures 47-50). Many spiders and some insects were observed in the plots on this unusually warm day.

The dredged material is weathering and gaining soil structure. More freezing and thawing cycles should complete much of the process. The establishment of thick grass on material excavated in late September demonstrates that vegetation can grow quickly to provide some protection from wind and water erosion after placement. It also appears that material placed in relatively thin lifts dewatered quickly enough to be handled by equipment soon after placement. The crack patterns in thin lifts expose much of the sediment to the air, which also promotes the development of soil structure. On large beneficial use sites, thin lifts could be placed and then piled to desired depths with heavy equipment without having to wait years for drying and formation of soil structure.

## Discussion and Conclusions.

The pump and placing boom had no difficulty handling the freshly excavated sediment. In a large-scale operation it would be necessary to use equipment designed or adapted to handle material of the sediment's consistency in order to efficiently feed the hopper and pump. Likewise equipment capable of screening larger foreign objects prior to pumping would be required.

The conveyor also had no difficulty handling the freshly excavated sediment. The sediment traveled well on the belts and through the transfer point, whether it was pumped into the hopper or loaded directly from the endloader bucket. The incline of the 40-foot feeder belt was about 20 degrees. The material stayed on the main belt even at incline angles up to 30 degrees. The belt scrapers performed well and there was no observed carryback from the end of the belt. The belts should be able to handle foreign objects more easily than the pump since there are fewer places for objects to lodge. The demonstration indicates that conventional conveyors could handle sediment provided that appropriate scrapers, hoppers and transfer points are used. Devices such as vibrators, agitators and air cannons are available to improve sediment flow through the hoppers. A vibrating grizzly type screen would likely enable sediment to flow through a grizzly while screening out foreign objects. Directional transfer chutes could facilitate smoother material flow between connecting conveyors to minimize splashing and spilling.

While truck-mounted units were used for the demonstration, the booms can be mounted in many configurations. The positive displacement pumps, placing booms and conveyors can also be used in combination. It is possible to place a pump on a float and feed it with an excavator, pump dredged material a distance and then discharge it directly from the pipe or with a placing boom. Pumps and conveyors are available in a wide range of sizes. Likewise a series of floating and/or land based conveyors could move material over considerable distances.

The sediment typical of Illinois River backwaters consists primarily of silt and clay with little sand. This material will cause little wear on belts, pumps and pipes. As with other dredging equipment, potential objects in the sediment, such as tree branches, lumber, cables, metal parts and bricks of certain sizes will have to be screened or avoided to prevent plugging or damaging the equipment. Trash racks with mechanical rakes or a grinder pump may prove useful in situations where debris is encountered.

This demonstration shows that conveyors and positive displacement pumps can move and place fine-grained sediment. Use of this type of equipment on the Illinois River system will depend on numerous factors including the distance material must be moved, availability of dredged material placement sites, configuration of dredge cuts, water depth and cost. Both systems could move sediment at or near *in situ* moisture content to sites without costly containment dikes, onto islands or into barges. The pump could also fill geotextile tubes.

This type of equipment may be particularly advantageous where a relatively small amount of material must be excavated for aquatic habitat restoration or small boat access and there are no nearby locations for a diked area to hold hydraulically dredged material. Another potential application is restoration of areas where shallow dredge cuts are desired, making conventional deeper-draft equipment unsuitable. If dredged material is barged to a site for beneficial use, conveyors or positive displacement pumps may be the most economical or least disruptive means of moving the unloaded material. Truck mounted or free-standing units could also spread material at desired elevations and depths at reclamation sites.

### **Acknowledgements.**

This demonstration was funded as part of the Illinois River Ecosystem Restoration project authorized in Section 519 of the Water Resources Development Act of 2000, administered by the Rock District of the U. S. Army Corps of Engineers. This is the first of three reports under contract DACW25-02-M-0373.

Michael J. Tarpey of the Rock Island District served as project engineer. John C. Marlin of the Illinois Waste Management and Research Center was the principal investigator.

Personnel from Putzmeister, Kress Corporation, Midwest Foundation, Artco Fleeting, the Illinois State Water Survey, Illinois Geological Survey, Waste Management and Research Center, Caterpillar Inc, and Illinois Department of Natural Resources, and University of Illinois Department of Natural Resources and Environmental Sciences contributed time and effort to the project. Dan Richardson, Joel Dexter, Ron Satzler, Blake Harvey, Chuck Burlingame, Bill Bogner, Robert Darmody, Dorivar Ruiz Diaz, John Marlin and Jim Gillis provided photographic assistance on this project. George Krumins compiled maps.

### **Disclaimer.**

The mention or use of companies, trade names and products in this report or the sediment handling demonstration does not constitute an endorsement by the Waste Management and Research Center or the U.S. Army Corps of Engineers.

## Illinois River and Illinois Waterway



Fig. 1. The sediment handling demonstration took place at Lacon, Illinois, 189 miles from the mouth of the Illinois River. The Illinois Waterway connects the Mississippi River to Lake Michigan. The Illinois River proper extends from Grafton, northeast of St. Louis to river mile 273 near Joliet. There the river is formed by the confluence of the Kankakee and Des Plaines Rivers. The waterway follows the Des Plaines and then branches to Lake Michigan via the Chicago River to the north and Calumet River to the south. The entire system is navigable by barges.

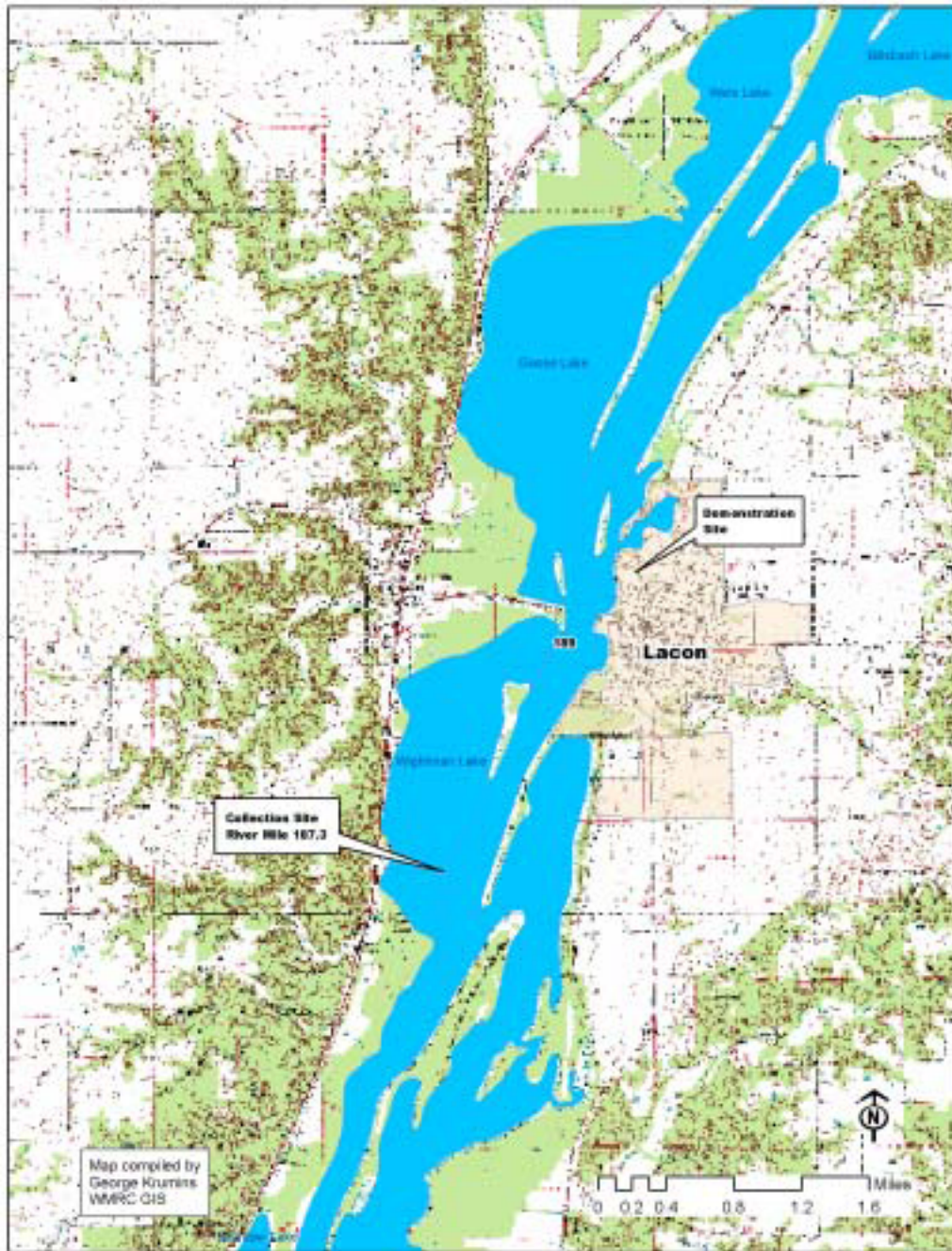


Fig. 2. Sediment for the handling demonstration was collected from the mouth of Wightman Lake at approximately river mile 187.3. Shallow water necessitated taking sediment near the navigation channel. The sediment was taken by deck barge to the Midwest Foundation dock at Lacon and trucked to a field. The site is about 25 miles north of Peoria, Ill.





Fig. 3. Concrete pump truck with folded placing boom.



Fig. 4. TB-105 conveyor truck prior to deployment.



Fig. 5. The site layout for the demonstration at Lacon, Ill., included a sediment stockpile in the foreground that was loaded to the pump truck on the left with a skidder. Sediment was pumped through a 32-meter placing boom shown here feeding the conveyor hopper. A feeder conveyor carried material to the top of the conveyor truck where it passed through a transfer point onto the 105-foot telescoping main belt and was placed on the field.



Fig. 6. A heaping bucket of sediment is removed from the backwater and placed on the deck barge on Sept. 25th. Most free water drained off.



Fig. 7. The first bucket of sediment placed on the deck illustrates the consistency of the material and lack of free water.



Fig. 8. Close-up of excavated material on the deck. Care was taken to avoid the original bottom and collect mostly sediment deposited since 1900.



Fig. 9. The sediment on the deck showed little tendency to slump and did not lose free water.



Fig. 10. After being clamshelled from the barge to a truck, the sediment was poured on a field.



Fig. 11. Sediment readily flowed from the trucks and formed piles about 32 inches high.



Fig. 12. The sediment stockpile the afternoon of Sept. 25. It retained its shape after placement.



Fig. 13. A skidder with a bucket deposits sediment into the hopper of the pump truck. The hopper is too narrow to be efficiently loaded this way because it is designed to receive concrete from a chute.





Fig. 14. The action of the displacement pump pulled sediment through the 2-inch grate and into the pump from the hopper. The grate was raised for most of the demonstration.



Fig. 15. The segmented placing boom allows great flexibility in placing dredged material. The boom can be mounted on bases other than trucks and can be at a distance from the pump.



Fig. 16. The pump truck's placing boom carried material to conveyor hopper, which in turn supplies the 18-inch wide feeder conveyor.



Fig. 17. The pumper's placing boom is capable of reaching high and could place material into trees, onto islands or on slopes.



Fig. 18. Early photo of pile forming from sediment pumped through the placing boom.



Fig. 19. The pumped pile immediately after placement retained a thick consistency.



Fig. 20. The telebelt extends 105 feet. A larger model can reach 130 feet. The extendable boom can cover a large area without moving the truck.



Fig. 21. Stiff material loaded to the conveyor hopper directly from the stockpile by the skidder bridged over the bottom opening.



Fig. 22. The moving belt pulled large chunks of sediment from the hopper bottom.



Fig. 23. Dollops of sediment from the endloader readily moved up the feeder to the transfer point. Material hitting the guide rollers and transfer point cover caused some splatter.



Fig. 24. Large chunks of sediment were flattened as they passed through the transfer point onto the 18-inch main belt.



Fig. 25. Dollops of sediment moving on the main belt after passing through the transfer point.





Fig. 26. Side view of sediment on main belt.



Fig. 27. Sediment taken directly from the stockpile retained some cohesiveness after conveying.



Fig. 28. Pumped sediment hitting the side of the hopper.



Fig. 29. Pumped sediment smeared on the feeder belt as it left the hopper.



Fig. 30. Sediment on the feeder conveyor approaches the transfer point after being pumped onto the side of the small hopper.



Fig. 31. Sediment pumped in line formed tubular shapes on the feeder belt that stayed centered. Here it approaches the transfer point.



Fig. 32. Pumped material centered on the main belt. The transfer point is at the top of the picture.



Fig. 33. Pumped material near the end of the belt. It passed over the section joint areas without problems.



Fig. 34. Main belt scraper.



Fig. 35. Clean underside of main belt shows effectiveness of the scraper.



Fig. 36. The telebelt continued to convey pumped sediment even when elevated 30 degrees. It too can place material on slopes and into trees.



Fig. 37. Sediment leaving the main belt at a fraction of the volume that can be handled.





Fig. 38. The conveyor placed a 20x40 foot plot of sediment about one foot thick. A 6-inch plot was also formed.



Fig. 39. The conveyor beginning to place a pile of pumped sediment.



Fig. 40. On Oct. 1, five days after placement the 6-inch is drying, especially on the edges. Each plot was divided into thirds: one planted with grass, one roto tilled, and one left as placed.



Fig. 41. The piles showed deep stress and desiccation cracks on Oct. 1.



Fig. 42. On Oct. 9 the piles were crusted and readily supported a person's weight. Half of each was planted with grass on Sept. 26. The edges are likely too dry to support germination.



Fig. 43. Grass was well established on the piles by Oct. 9. Most seeds germinated in the cracks which were moist. Few seeds germinated on the crusted top.



Fig. 44. By Oct. 22 the 6-inch plot was dry and quite hard with no soil structure. The 12-inch plot was not as dry, but was firm underfoot.



Fig. 45. The pumped piles supported lush grass growth, probably because their greater depth retained more moisture.



Fig. 46. A block of drying sediment removed along crack lines on Oct. 22 is firm, and shows no soil structure.



Fig. 47. By Jan. 8, 2003, The grass was still green and thick on the piles. Grass could protect fields of sediment from erosion while it weathers.



Fig. 48. The surface of both plots and the piles showed evidence of weathering and soil structure on Jan. 8<sup>th</sup>.



Fig. 49. On Jan. 8 clods of dredged material readily crumbled showing the effect of freezing and thawing. Weathering of the material was evident several inches into the plots and piles.

## **Appendices**

- Appendix A. Measurements of the cone shaped piles of sediment placed by the conveyor and the pump placing boom.
- Appendix B. Report from Putzmeister on observations on equipment performance during the sediment handling demonstration.
- Appendix C. Report from Whitney and Associates on physical properties of sediment used at the demonstration.



X-Sender: bogner@zeus.sws.uiuc.edu  
X-Mailer: QUALCOMM Windows Eudora Version 5.1  
Date: Fri, 27 Sep 2002 10:14:58 -0500  
To: jmarlin@wmrc.uiuc.edu  
From: Bill Bogner <bogner@uiuc.edu>  
Subject: Plop profiles

John -- Attached is an Excel sheet with the notes, Plots, and some comments regarding the profiles that Dan and I measured. While these were not necessarily measured from the same same vertical reference point, I think that they do represent a good measure of the profile changes. The radius of the pumped profile increased since we started measuring almost as soon as they removed the pump hose. The conveyor plop sat for about 15 minutes before we initiated the measurement.

BB

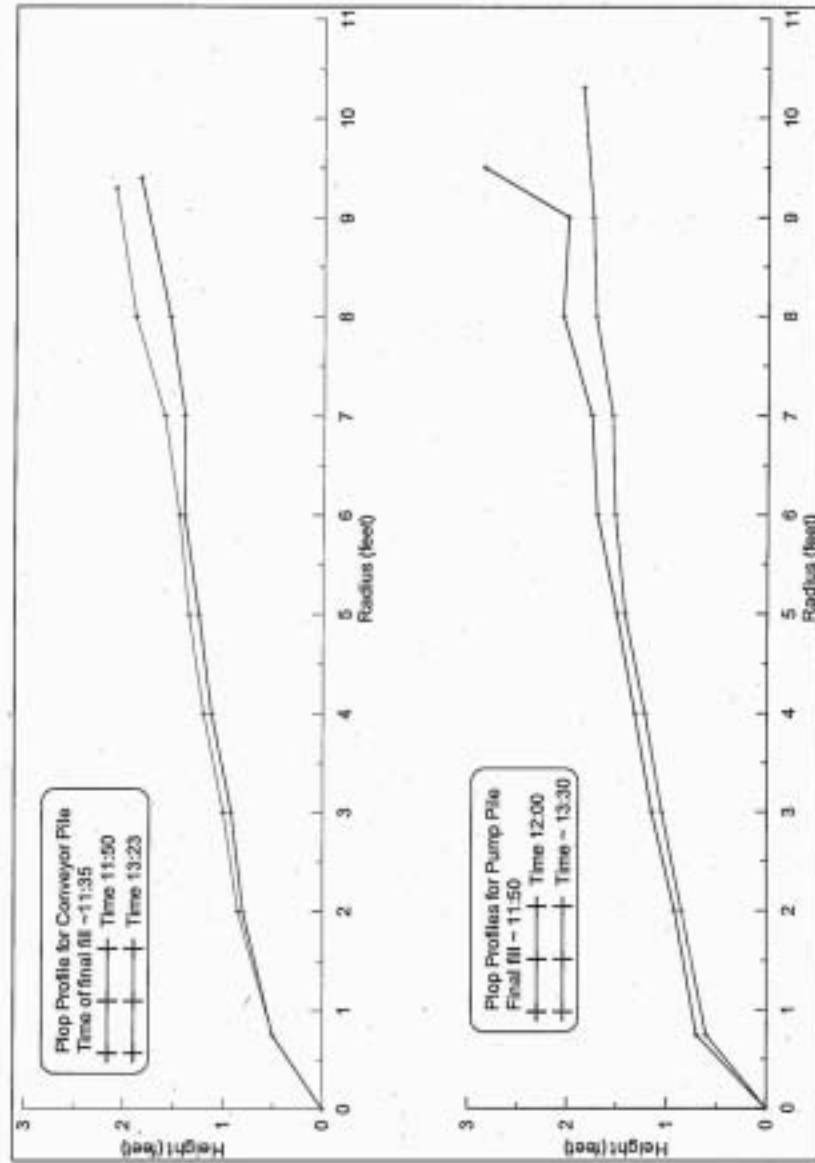
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Fax 217-333-2304



Lacon-plopprofiles.xls





See noted in rows 21-30

Plot at row 41

Final fill 11:35 11:50

Conveyor Pile		Pumped Pile		Conveyor Pile		Pumped Pile	
Dist	Height	Dist	Height	Dist	Height	Dist	Height
Time	11:50	Time	12:00	Time	13:23	Time	Immediately following
9.3	2.1	9.5	2.85	9.4	1.85	10.3	1.85
8	1.9	9	2	8	1.55	9	1.75
7	1.6	8	2.05	7	1.4	8	1.72
6	1.45	7	1.76	6	1.4	7	1.55
5	1.35	6	1.7	5	1.25	6	1.52
4	1.2	5	1.5	4	1.12	5	1.42
3	1	4	1.32	3	0.92	4	1.22
2	0.85	3	1.15	2	0.8	3	1.05
0.75	0.5	2	0.92	0.75	0.5	2	0.85
0	0	0.75	0.7	0	0	0.75	0.6
		0	0			0	0

Piles formed and measured at times indicated on 9/26/2002.

Measurements made from South side of conveyor pile and north side of pumped pile.

Measuring points not marked. This is an improvement in the method that would improve future monitoring of a similar nature.

Plot horizontal reference is from the outer edge. This was easiest to measure in the field. Plot reference could be easily reversed if needed.

For pumped pile, measurement was initiated immediately after pumping stopped.

Radial expansion in the pumped pile is probably real but may also be an effect of inconsistent measurement point.

From: "Bill Carbeau" <carbeaub@putzam.com>  
To: <jmarlin@wmrc.uiuc.edu>  
Cc: "Martin Mayer" <mayerm@putzam.com>  
Subject: Site test report  
Date: Mon, 2 Dec 2002 12:16:24 -0500  
X-Mailer: Microsoft Outlook, Build 10.0.2616  
Importance: Normal

Hi John;

Here is the brief report you requested on the dredge test.  
Thanks,  
Bill



Dredge material report Natural Resources 12.2.02.doc

## REPORT

### **Illinois Department of Natural Resources**

One East Hazelwood Drive  
Champaign, IL 61820

Attn: John Marlin Ph.D.

RE: Dredged material pump and belt test observations

Dear John;

We are providing you with our observations from the viewpoint of the equipment performance in the September material handling test we observed.

#### EQUIPMENT:

One Concrete boom pump Putzmeister BSF32-16

One telebelt Putzmeister model TB105 truck mounted telescoping conveyor.

#### MATERIAL:

Dredged river bottom mud composed primarily of top soil runoff without foreign bodies. The material has the consistency of jelly with approximately a 12 slump. The abrasion characteristics of the material are very low in our opinion.

#### EQUIPMENT OPERATION – TELEBELT:

The telebelt is a truck mounted telescoping conveyor with a maximum reach of 105 feet capable of moving up to 350 cubic yards of material per hour. The test was performed under very slow conditions because of loading restrictions to the machine. The material was easily conveyed with little splatter or return on the belt. It is possible that the material could liquefy slightly if transported on a conveyor over long distances. There was some bridging of the material because of the hopper type we selected but this can be easily overcome by using a different style loading hopper. When the pump was used to load the telebelt, the bridging problem disappeared.

#### EQUIPMENT OPERATION – PUMP:

The pump is a truck mounted concrete pump with an articulated 32 meter boom. The line size is 5" over the total distance. Material was loaded into the pump with a small loader that limited production. The machine is capable of delivering material at a maximum volume of 200 yards per hour. Our output was closer to 20 yards per hour because of the

limitation in loading. The purpose was to establish that the material can be pumped successfully.

Our observation was that there is no problem whatsoever in pumping this material. The pressure readings were very low indicating little resistance or power required to move this material. We estimate no problem in moving this material over distances up to 2 miles horizontally with pumps based on appearance and flowability of the material, and pressure on generated by the equipment.

**CONCLUSION:**

There are many types of pumps made by Putzmeister capable of moving this material over long distances and at varying volumes. We feel a simple and reliable system could be assembled to produce the results required by any client wanting to move the material.

Many possible uses and applications were discussed to use this material. The pump or belt could be incorporated in the operation to reduce costs, reduce water content, and streamline delivery.

Very truly yours,  
PUTZMEISTER, INC.

Bill Carbeau  
Sales and Product Manager  
Telebelts and Specialty Equipment

**Documentation to Accompany Whitney & Associates Report of 11-5-02.**

Prepared by John C. Marlin

Whitney & Associates of Peoria, Illinois, when analyzing sediment samples from the Illinois River backwaters, used the following standards:

Grain Size Analysis Test	ASTM D-422
Atterberg Limits Test	ASTM D-4318
Moisture Content Test	ASTM D-2216
Specific Gravity Test	ASTM D-854

Information on samples referred to in this report:

Samples were placed in sealed plastic bags.

SPIN-1 and 2. Samples were taken of sediment being loaded on a barge from shallow water on Sept. 27, 2002 near the main channel in Lower Peoria Lake near River Mile (RM) 165.5.

WTM- 8--11. Samples of sediment taken within an hour of being removed from shallow water in Wightman Lake near the main channel at RM 187.5 south of Lacon, Ill., on Sept. 25, 2002. Samples were from several areas on the deck; no two samples were from the same bucket.

WTM-12, 13, and 14. Samples were taken from one spot in the sediment stockpile for the handling demonstration. Sample 12 was taken 0.1 to 0.4 inches below the top of the pile, sample 13 was taken 1.0 to 1.3 feet below the top, and sample 14 was taken 2.0 to 2.3 feet below the top of the pile near the original soil surface. They were taken to provide insight as to whether or not the sediment lost moisture to the dry ground or air while stockpiled overnight.

WTM-15 and 16. Samples were taken a few inches below the surface of two sediment piles consisting of material that had been pumped and conveyed. The samples were taken at about 3 PM on Sept. 26, 2002.

Other listed samples were for another project.

C1

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TESTS • INVESTIGATIONS  
ANALYSIS • DESIGN • EVALUATIONS  
CONSULTATION • REPORTS • INSPECTIONS  
ARBITRATION • EXPERT WITNESS TESTIMONY  
\*\*\*\*\*  
SOILS • PORTLAND CEMENT CONCRETE  
AUTOMOBILE CONCRETE • STEEL  
ASPHALT • AGGREGATES • EMULSIONS  
POZZOLANIC MATERIALS • LIME



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**TELEFAX**  
309-673-3050

GEOTECHNICAL ENGINEERING  
CONSTRUCTION QUALITY CONTROL  
SUBSURFACE EXPLORATIONS  
ENVIRONMENTAL INVESTIGATIONS  
\*\*\*\*\*  
MONITORING WELL INSTALLATIONS  
SULFUR POXY INVESTIGATIONS  
WELDER CERTIFICATIONS  
INSURANCE INVESTIGATIONS

**CLIENT:**

Mr. John Marlin  
Waste Management Research Center  
1 East Hazelwood  
Champaign, Illinois 61820

**W&A FILE NO.** 2680001  
**DATE:** 11-05-02

**PROJECT:**

Illinois River Sediment Evaluation  
Central Illinois Area

**MOISTURE CONTENT TEST RESULTS**

SAMPLE NUMBER	NET WEIGHT WET SOIL GRAMS	NET WEIGHT DRY SOIL GRAMS	WEIGHT WATER GRAMS	MOISTURE CONTENT-% *
SPIN-1	166.4	86.3	80.1	92.8
SPIN-2	164.6	84.6	77.0	91.0
WTM-8	228.5	152.0	74.5	49.0
WTM-11	236.2	122.0	114.2	93.6
WTM-6	222.4	122.5	99.9	81.6
WTM-7	245.9	135.2	110.7	81.9
WTM-12	194.1	121.2	72.9	60.1
WTM-13	210.3	130.4	79.9	61.3
WTM-14	188.4	120.1	68.3	56.9
WTM-15	174.7	113.4	61.3	54.1
WTM-16	244.1	151.8	* 92.3	60.8
TS-1A	107.0	54.2	52.8	97.4
TS-2A	65.6	32.7	32.9	100.6
TS-2B	117.7	61.1	56.6	92.6
TS-3	125.0	61.8	63.2	102.3
TS-4A	106.8	54.5	52.3	96.0
TS-4B	133.5	68.0	65.5	96.3

\*DRY WEIGHT BASIS

**WHITNEY & ASSOCIATES**  
PEORIA, ILLINOIS

SAMPLE NUMBER	NET WEIGHT WET SOIL GRAMS	NET WEIGHT DRY SOIL GRAMS	WEIGHT WATER GRAMS	MOISTURE CONTENT-% *
PXTR-1	146.0	79.1	66.9	84.6
PXTR-2	158.7	79.7	79.0	99.1
PXTR-3	162.4	94.8	87.6	92.4
PXTR-4	188.8	98.4	90.4	91.9
PXTR-5	168.0	85.5	82.5	98.5
PXTR-6	168.8	86.8	82.0	94.5
PXTR-7	163.2	81.9	81.3	99.3
PXTR-8	174.4	87.4	87.0	99.5
PXT-9	133.9	77.6	56.3	72.6
PXT-10	128.6	65.5	63.1	98.3
PXT-11	191.1	124.4	66.7	53.6

\*DRY WEIGHT BASIS

**ATTERBERG LIMITS TEST RESULTS**

SAMPLE NUMBER	SPIN-1	SPIN-2	WMT-8
LIQUID LIMIT-%	94	96	41
PLASTIC LIMIT-%	32	37	30
PLASTICITY INDEX-%	62	59	11
SPECIFIC GRAVITY	2.63	2.62	2.59

SAMPLE NUMBER	WMT-11	WMT-15
LIQUID LIMIT-%	89	-
PLASTIC LIMIT-%	40	-
PLASTICITY INDEX-%	49	-
SPECIFIC GRAVITY	2.55	2.61

WHITNEY & ASSOCIATES  
PEORIA, ILLINOIS



**HYDROMETER ANALYSIS TEST RESULTS**

SIEVE DESIGNATION	PERCENTAGE FINER - %	
	SPIN-1 SPINDLER MARINA #1	SPIN-2 SPINDLER MARINA #2
#10	100	100
#20	100	100
#40	99	99
#60	97	97
#140	93	95
#200	91.4	93.8
MAXIMUM DIAMETER - M.M.		
.0400	70	67
.0200	57	58
.0150	49	54
.0100	43	51
.0074	40	48
.0050	35	40
.0036	30	36
.0010	22	26
SAND-%	9	6
SILT -%	67	64
CLAY-%	24	30

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SIEVE DESIGNATION	PERCENTAGE FINER - %	
	WTM-8 WIGHTMAN LAKE #8	WTM-11 WIGHTMAN LAKE #11
#10	100	100
#20	100	100
#40	100	98
#60	99	98
#140	90	93
#200	74	91.2
MAXIMUM DIAMETER - M.M.		
.0400	55	69
.0280	46	58
.0150	38	54
.0100	36	51
.0074	33	44
.0050	28	38
.0036	25	34
.0010	22	24
SAND-%	26	9
SILT -%	46	53
CLAY-%	28	38

Should you have any questions or comments whatsoever in regard to these test results, or if any additional information is desired, please do not hesitate to contact me personally at your convenience.

Respectfully submitted,

WHITNEY & ASSOCIATES

(By)

Douglas R. Whitney, P. E.

DRW:rma

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TESTS  
DESIGN  
REPORTS  
ANALYSIS  
SUPERVISION  
INVESTIGATIONS



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STEEL, REINFORCED CONCRETE  
CONSTRUCTION MATERIALS  
ASPHALT - ASPHALT - PCC - D.P.C.  
SOILS AND GRAVEL SURVEYS  
MATERIALS QUALITY CONTROL  
SOIL MECHANICS AND  
FOUNDATION ENGINEERING  
SKILLING - CORING - TESTING

PROJECT: Illinois River Sediment Evaluation  
Central Illinois Area

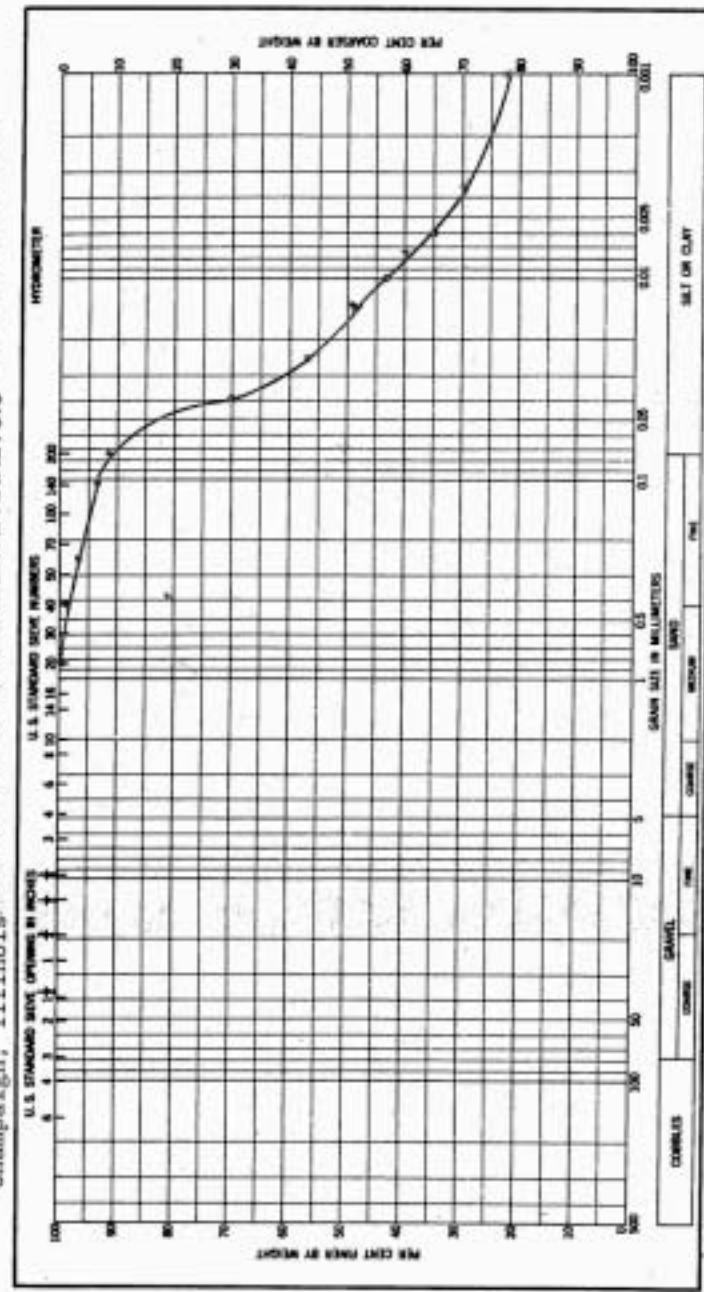
CLIENT: MMRC

Champaign, Illinois

# REPORT OF SOIL/AGGREGATE ANALYSIS

W. & A. FILE NO. 2660  
DATE 11-05-02

SPINDLER MARINA #1



SOIL/AGGREGATE CLASSIFICATION: ORGANIC FAT CLAY - OH  
UNIFORMITY COEFFICIENT:  $\frac{D_{60}}{D_{10}} = 1.5$   
EFFECTIVE GRAIN SIZE:  $D_{50} = 0.075$  mm

WHITNEY & ASSOCIATES  
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308 873-2121

TESTS  
INSTRUMENTS  
REPORTS  
ANALYSIS  
INSPECTION  
CONSULTATION  
INVESTIGATIONS



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STEEL - BITUMINOUS MATERIALS  
CONSTRUCTION MATERIALS  
AGGREGATES - ASPHALT - POLY-PROPYLENE  
SOILS AND GRAVEL SURVEYS  
WATER - SOIL QUALITY CONTROL  
SOILS - FOUNDATION ENGINEERING  
DRILLING - CORING - TESTING

Illinois River Sediment Evaluation  
Central Illinois Area

PROJECT:

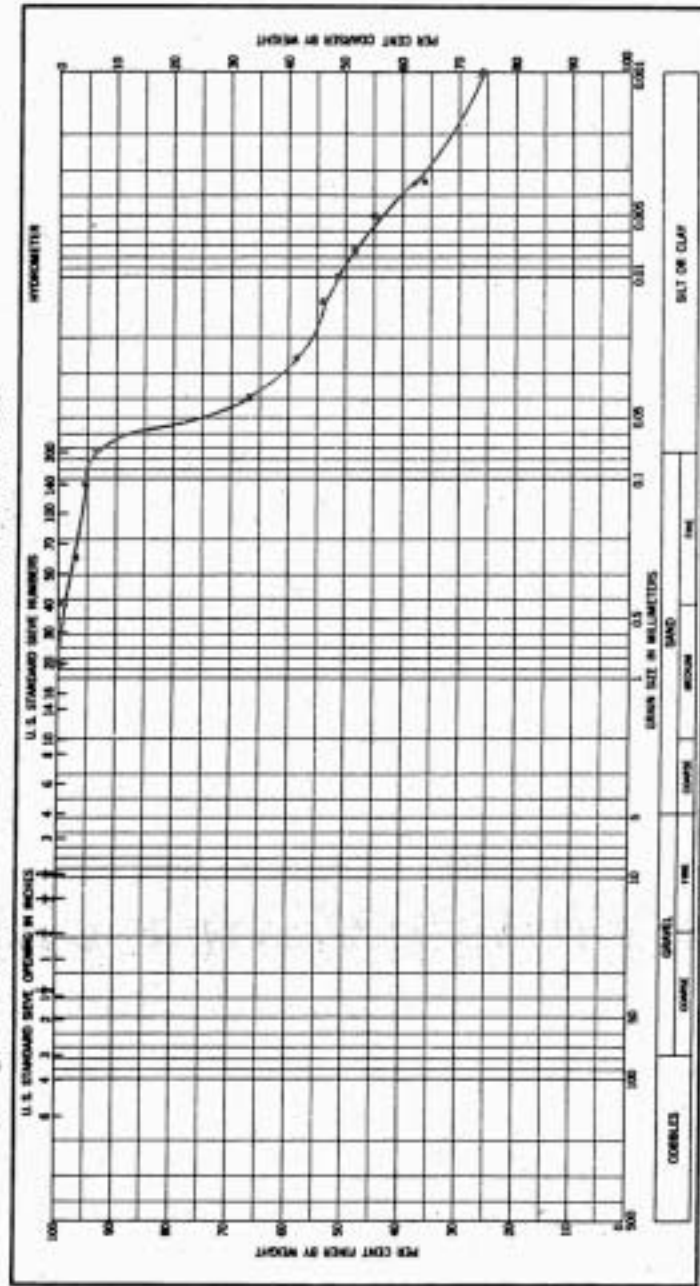
CLIENT: WMRC

Champaign, Illinois  
REPORT OF SOIL/AGGREGATE ANALYSIS

W. & A. FILE NO. 2660

DATE 11-05-02

SPINDLER MARINA #2



WHITNEY & ASSOCIATES  
PEORIA, ILLINOIS

SOIL/AGGREGATE CLASSIFICATION ORGANIC FAT CLAY - OH  $D_{10} = 0.0075$   $D_{60} = 0.075$   $D_{90} = 0.25$  EFFECTIVE GRAIN SIZE  $D_{10} = 0.0075$

TELEPHONE  
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TESTS  
DESIGN  
REPORTS  
ANALYSIS  
INVESTIGATIONS  
CONSULTATIONS



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STEEL REINFORCED CONCRETE  
CONCRETE MASONRY  
AGGREGATES - ASPHALT - POLY-CHANG  
SOILS AND GRAVEL SURVEYS  
WATERWAYS QUALITY CONTROL  
SOIL MECHANICS AND  
FOUNDATION ENGINEERING  
DRILLING - CORING - TESTING

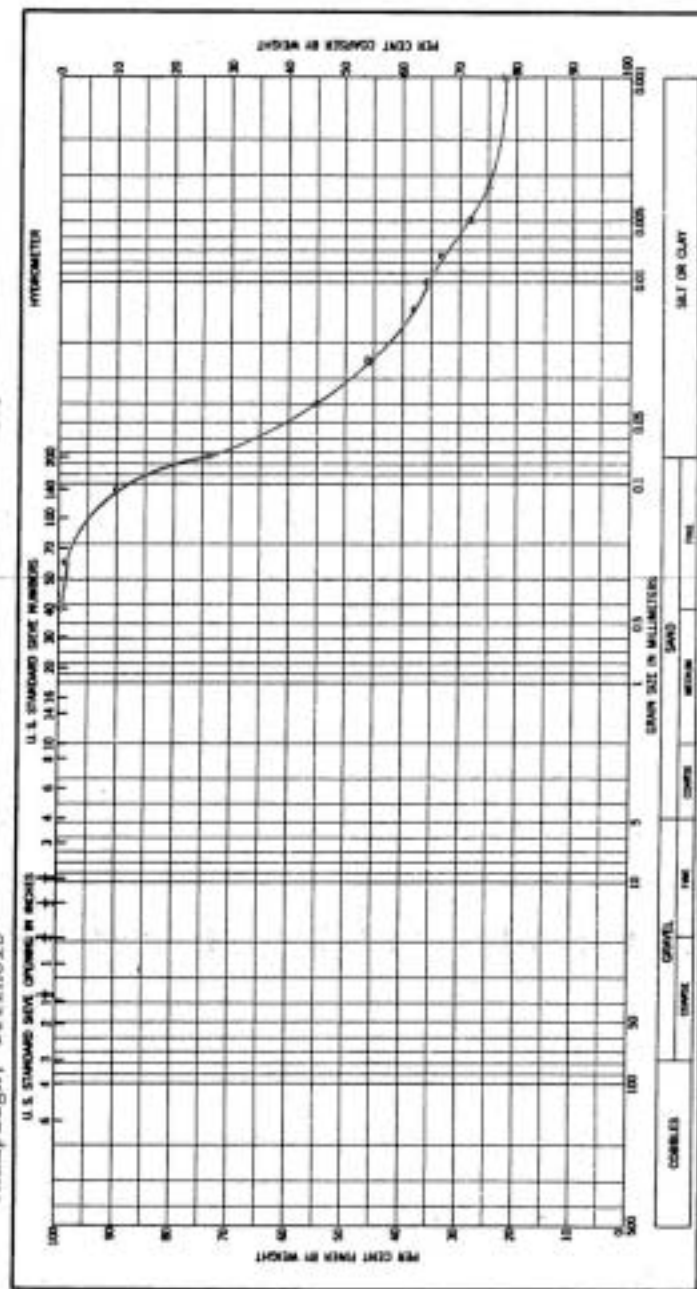
Illinois River Sediment Evaluation  
PROJECT: Central Illinois Area

CLIENT: WMRC  
Champaign, Illinois

# REPORT OF SOIL/AGGREGATE ANALYSIS

WIGHTMAN LAKE #8

W. & A. FILE NO. 2660 DATE 11-05-02



SOIL/AGGREGATE CLASSIFICATION: ORGANIC SILT WITH SAND --OL--  
UNIFORMITY COEFFICIENT,  $U_w =$  EFFECTIVE GRAIN SIZE,  $D_{10} =$

WHITNEY & ASSOCIATES  
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TESTS  
ANALYSIS  
REPORTS  
ANALYSIS  
INSPECTION  
CONSULTING  
INVESTIGATIONS



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STEEL - BITUMINOUS CONCRETE  
CONCRETE REPAIRS  
AGGREGATES - ASPHALT - PCC - CPAC  
SOILS AND GRAVEL SURFACES  
MAINTENANCE OF HIGHWAYS  
SOIL MECHANICS AND  
FOUNDATION ENGINEERING  
DRILLING - CORING - TESTING

Illinois River Sediment Evaluation  
PROJECT: Central Illinois Area

CLIENT: IMRC

Champaign, Illinois

# REPORT OF SOIL/AGGREGATE ANALYSIS

W. & A. FILE NO. 2660  
DATE 11-05-02

WIGHTMAN LAKE #11

